

Prior to the continued examination, please amend the above-identified application as follows, wherein paragraph numbers refer to paragraphs of the application as published July 22, 2004 as U.S. Patent Application Publication No. US 2004/0143264 A1, and page and line references refer to locations in Applicant's substitute specification filed March 24, 2004:

AMENDMENTS TO THE ABSTRACT

Please replace the current abstract with the following paragraph:

Embodiments of a motion preserving spinal implant system are disclosed. Such systems may comprise a first bone anchor, a second bone anchor and a motion preserving implant. In some embodiments, the implant includes a sleeve partially encircling the rod to allow relative motion between the rod and the sleeve and a bumper to dampen excessive spinal extension movement. In certain embodiments, the implant may be coupled to at least one of the bone anchors in an off-set manner.

AMENDMENTS TO THE BRIEF DESCRIPTION OF THE DRAWINGS

Please replace paragraph [0028] beginning on page 5, line 16, with the following amended paragraph:

FIG. 6A and 6B illustrates the components and construction of a one-piece non-slotted rod connector.

Please replace paragraph [0029] beginning on page 5, line 18, with the following amended paragraph:

FIG. 7A and 7B illustrates the components and construction of a pedicle screw in accordance with the invention.

Please replace paragraph [0030] beginning on page 5, line 20, with the following amended paragraph:

FIG. 8A and 8B illustrates the details of a split connector.

Please replace paragraph [0031] beginning on page 5, line 21, with the following amended paragraph:

FIG. 9A and 9B illustrates construction details of a metal sleeve connector suitable for press-fitting a UHMWPE sleeve.

Please replace paragraph [0032] beginning on page 5, line 23, with the following amended paragraph:

FIG. 10A and 10B shows top and end views of a UHMWPE spool, suitable for slip fitting over a rod.

Please replace paragraph [0033] beginning on page 6, line 1, with the following amended paragraph:

FIG. 11A and 11B shows the embodiment of the invention as a bumper.

AMENDMENTS TO THE SPECIFICATION

Please replace paragraph [0041] beginning on page 7, line 13, with the following amended paragraph:

Referring to FIG. 1, the elements and attachment of the spinal rod sleeve system (20a) may be seen. The sleeve or bushing (19) is cylindrical in shape (and may be continuous or c-shaped) and (viewed in cross-section) has an external surface (**1**) and an interior or bearing surface (**2**) within which a spinal rod (**3**) fits.

Please replace paragraph [0042] beginning on page 7, line 18, with the following amended paragraph:

The system is attached to a patient's spine or vertebrae (**4**) using suitable anchoring means known to those skilled in the art—in FIG. 1 (by way of illustration), sub laminar wires (**5**), but other

bone anchors (7) (Fig. 3) could include screws, pedicle screws (Fig. 2), wires, sublaminar wires or hooks such as a C-ring (12) shown in Fig. 5.

Please replace paragraph [0043] beginning on page 7, line 23, with the following amended paragraph:

FIG. 2 illustrates use of the spinal rod system (20b) for posterior nerve root decompression using pedicle screws (6).

Please replace paragraph [0044] beginning on page 7, line 25, with the following amended paragraph:

The spinal rod sleeve system (20c), as shown in FIG. 3 (and an alternative in FIG. 7A and 7B), the longitudinal rod (3) is preferably attached so that it tracks over the vertebral pedicle (8), allowing the axis of the screw (7) and rod (3) to be intersecting and minimizing or eliminating any offset between the longitudinal axis of the screw (7) and the longitudinal axis of the rod (3), thus reducing torque and thereby reducing binding friction between the gliding surfaces and improving motion.

Please replace paragraph [0045] beginning on page 8, line 3, with the following amended paragraph:

Preferred construction details of components of the spinal rod sleeve system (20a-20c) are shown in FIGS. 4-10. Note that (as shown in FIG. 6A and 6B) the rod connector may be solid, slotted (10), or composed of two opposing c-clamps or split connectors(9) and a nut (14) as shown in Fig. 6B and Fig. 8A and 8B. Ideally, the longitudinal rod (3) is made of a hard material such as metal, and the surfaces coming into contact with the rod (3) have a plastic or similar gliding surface. The gliding surface, such as the rod sleeve (19), has an internal bearing layer (2) of softer material such as plastic or UHMWPE in contact with the rod (3). The next outer layer (1) providing a casing around or surrounding the plastic is also a harder material which provides attachment to the bony vertebra (4).

Please replace paragraph [0046] beginning on page 8, line 14, with the following amended paragraph:

More generally, the spinal rod sleeve system (20a-20c) can be used in treating a spinal disorder whose treatment would benefit from allowing a vertebra (4) to slide cephalad or caudad along a spinal rod sleeve system (20a-20c), or otherwise preserving spinal motion, by anchoring such a system to a patient's spinal lamina, spinous processes, pedicles or posterior elements of the spine. The internal bearing layer around the rod (3) allows gliding motion between the rod (3) and the inner surface (2) of the sleeve (19); using low-friction materials facilitates motion approaching that of a normal spine.

Please replace paragraph [0047] beginning on page 8, line 23, with the following amended paragraph:

Anchoring the system (20a-20c) to bone using a rotating (i.e., “polyaxial”) or fixed (i.e., “monoaxial”) attachment permits the adjacent vertebrae (4) to get closer together or farther apart.

Please replace paragraph [0048] beginning on page 8, line 26, with the following amended paragraph:

As compared to metal to metal surfaces, the disclosed invention provides a lower coefficient of friction. The difference is more pronounced if the surfaces are non concentric—i.e., if the outer metal sleeve (19) doesn't exactly conform to the longitudinal rod (3) because the inner rod (3) needs to be bent to conform to the patient's normal lumbar lordosis and normal thoracic kyphosis. Since by definition the two bearing surfaces in the spine are not going to be concentric they will not be amenable to a metal-on-metal bearing surface or inner metal surface on the rod sleeve (19).

Please replace paragraph [0049] beginning on page 9, line 5, with the following amended paragraph:

The bone anchor (7) may be a differentially locking polyaxial screw which attaches to the longitudinal rod (3); this allows differential polyaxial movement or could be locked differentially to different motions. For example, it could allow flexion/extension but prevent anterior vertebral

translation, or it could maintain sagittal alignment of fixation yet prevent spinal flexion, extension or bending, or it could allow rotation but not allow rocking or sliding down the longitudinal axis of the rod (3).

Please replace paragraph [0050] beginning on page 9, line 13, with the following amended paragraph:

As shown in FIG. 11, the UHMWPE sleeves or blockers (19a-19c) can also function as blockers or bumpers (18a and 18b) to dampen excessive spinal extension movement. The bumpers (18a and 18b) may be manufactured from UHMWPE or another plastic material. During extension of the spine no gap may exist between the sleeves (19a-19c) and the bumpers (18a and 18b), respectively. During flexion of the spine a gap may exist between the sleeves (19a-19c) and the bumpers (18a and 18b), respectively.

Please replace paragraph [0051] beginning on page 9, line 16, with the following amended paragraph:

Alternative embodiments utilizing the underlying invention include a metal backed rod sleeve (19) (preserving spinal motion) as previously shown in Fig. 1, sublaminar wires (5) attaching the metal backed UHMWPE rod sleeve (19) as previously shown in Fig. 1, pedicle screws (6) directly incorporating UHMWPE rod sleeves (19) as shown in Fig. 7A and 7B, slotted or offset rod connectors (10) attaching pedicle screws (6) to metal backed UHMWPE rod sleeves (19) as shown in Fig. 6A and 6B, hooks attaching to vertebra (4) and incorporating a metal backed UHMWPE rod sleeve (19), and transverse rod connector (11a-11c), as shown in Fig. 5, fabricated as a sandwich having an outer layer (22a and 22b) of metal or other suitable material and an inner layer (23a and 23b) of plastic (preferably UHMWPE) or other material suitable for bearing on a spinal rod (3) so as to enable cephalad or caudad sliding motion which is shown in detail in Fig. 4, as shown in FIGS. 4-7.

Please replace paragraph [0052] beginning on page 9, line 27, with the following rewritten paragraph:

More generally, the invention may be used in any procedure where allowing a vertebra (4) to slide cephalad or caudad along a spinal rod sleeve system (20), or otherwise preserving spinal motion, is desirable.

Please add the following new paragraph after the amended paragraph [0044], which begins on page 7, line 25:

Referring to Fig. 7A and 7B a pedicle screw (6) with a sleeve (19) is shown having an external or outer surface (1) and an interior or bearing surface (2) within which a spinal rod (3) may fit as alternatively shown in Fig.3. The pedicle screw (6) may be tapered and the sleeve 19 may have a tapped hole (13) for a set screw.

Please add the following new paragraph after the amended paragraph [0049], which begins on page 9, line 5:

Referring to Fig. 9A and 9B a metal sleeve connector (16) is shown which may have a tap hole (22) for a set screw and may create a press fit for UHMWPE rod sleeves. Referring to Fig. 10A and 10B a UHMWPE spool plastic insert 17 is shown which may be suitable for slip fitting over rod (3).